

Park It Over There, Buddy: An Inquiry Into Station-Area Parking and Transit-Oriented  
Development

By

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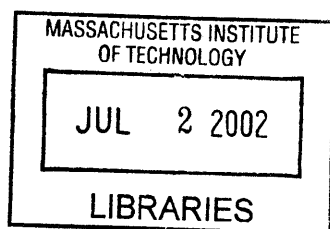
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On May 16, 2002 in Partial Fulfillment of the Requirements for the Degree of Master in City Planning

## ABSTRACT

Land use planning and regulation is essentially a task of balancing priorities and making choices. The choices made over the better part of the 20<sup>th</sup> century prioritized separation of uses and low-density development, which has ultimately led to suburban sprawl and traffic congestion. One of the most significant choices has been and continues to be the choice between automobile infrastructure, such as parking, and human-scale development.

Many small choices, made over a long time frame, have been made with an assumption that the provision of parking is a public good. Consequently, parking has been prioritized over other public goods, such as sidewalks, trees, and a sense of place. Experience has shown that parking in fact generates negative externalities, from pollution to traffic congestion. The typical responses to negative externalities – regulation and pricing– are infrequently applied to parking. If we choose to prioritize quality of life, community, and environmental sustainability over automobile dominated development, our attitude towards parking must change.

In this thesis I explore the general relationship between parking policy and sprawl and focus on the conflict between parking and development in the area of transit stations. I argue that station-area parking issues must be resolved for Transit-Oriented Development to become an effective method of addressing sprawl and making better communities. I also argue that the design quality of station-area parking lots and structures is an important factor in the success of Transit-Oriented Development. To support these arguments, I investigate the relationship of station-area parking to Transit-Oriented Development. I explore the decision making processes which lead to the allocation and design of the station-area parking supply and investigate design techniques which minimize conflicts between drivers and other stakeholders in the station area.

I make general design and policy recommendations for station-area parking and more specific recommendations for Tren Urbano, a new heavy-rail rapid transit system in Puerto Rico. I also briefly mention specific financial strategies for addressing parking externalities, such as a regional parking tax.

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## I. INTRODUCTION

Land use planning and regulation is essentially a task of balancing priorities and making choices. The choices made over the better part of the 20<sup>th</sup> century prioritized separation of uses and low-density development, which has ultimately led to suburban sprawl and traffic congestion. One of the most significant choices has been and continues to be the choice between automobile infrastructure, such as parking, and human-scale development.

Many small choices, made over a long time frame, have been made with an assumption that the provision of parking is a public good. Consequently, parking has been prioritized over other public goods, such as sidewalks, trees, and a sense of place. Experience has shown that parking in fact generates negative externalities, from pollution to traffic congestion. The typical responses to negative externalities – regulation and pricing– are infrequently applied to parking. If we choose to prioritize quality of life, community, and environmental sustainability over automobile dominated development, our attitude towards parking must change.

In this thesis I explore the general relationship between parking policy and sprawl and focus on the conflict between parking and development in the area of transit stations. Concentrating development in the station-area is a principle of Transit-Oriented Development. In this thesis, I argue that station-area parking issues must be resolved for Transit-Oriented Development to become

an effective method of addressing sprawl and making better communities. I also argue that the design quality of station-area parking lots and structures is an important factor in the success of Transit-Oriented Development. To support these arguments, I investigate the relationship of station-area parking to Transit-Oriented Development. I explore the decision making processes which lead to the allocation and design of the station-area parking supply and investigate design techniques which minimize conflicts between drivers and other stakeholders in the station area.

### Methodology

In the preparation of this thesis, which is essentially qualitative in nature, I began with a review of the relevant literature, the results of which are summarized in the next section. I then carried out a series of case studies at six transit systems in the United States. To gather information for these case studies, I conducted interviews with city planners, developers, architects, and transit agency staffers. I also visited all of the transit systems in question and visually documented the station area. From this research, I developed recommendations for parking regulation and design policy, which conclude this work.

## II. LITERATURE REVIEW

While significant work has been done on the topic of Transit-Oriented Development and on the topic of parking, relatively little has been done on the relationship between the two. Much of the work on parking design is in the form of architectural standards intended as reference tools for architects and engineers. Few have considered parking as a design end in itself.

### Transit-Oriented Development

The most influential work on TOD has been done by two Californians: Robert Cervero, a professor at the University of California, Berkeley, and Peter Calthorpe, a San Francisco-based architect. In Calthorpe's 1993 work, *The Next American Metropolis: Ecology, Community, and the American Dream*, he outlines his vision of TOD and its role in the regional context. Calthorpe defines TOD as "moderate and high-density housing, along with complementary public uses, jobs, retail and services, ... concentrated in mixed-use developments at strategic points along the regional transit system" (41).

Calthorpe addresses the role of the automobile in TOD throughout the design guidelines section. Despite the reduction of VMT, Calthorpe's TOD is not car free. He states practically, "the land use patterns in TODs, as well as their internal street system, must plan for on-going auto use"(62). Regarding transit access, "park-and-ride lots would continue to be a part of any system, but should not typically be located within

TODs" (48). He also notes, more helpfully, that while developers will be reluctant to reduce and relocate parking, this can be addressed through the implementation of regional standards.

*Transit Villages in the 21<sup>st</sup> Century*, written with Michael Bernick, is Cervero's major work on TOD. They define the transit village as a "compact, mixed-use community, centered around the transit station that, by design, invites residents, workers, and shoppers to drive their cars less and ride transit more" (5). The purpose of the transit village is thus dual: to reduce VMT and encourage community building. The origin of the transit village is traced back to American rail-based developments in the early 20<sup>th</sup> century. They also discuss successful rail-based development around the world and emerging development in the United States.

Cervero is always careful to stress that his transit village does not have high densities. Whether this is due to his personal preference for low-to-mid density living or a conviction that the American public simply will never accept higher densities, he doesn't say. His refusal to consider high densities limits the growth of the transit component of the transit-oriented development, as high capacity rail systems require either high densities or extensive station access provision, such as feeder buses or park-and-ride.

Discussion of parking issues is sprinkled throughout the work, but no in-depth discussion

is made. He generally supports minimizing off-street parking and siting it appropriately.

In *The Transit Metropolis*, Cervero examines the transportation systems of cities around the world. His comments on parking are restricted to mention of the various policies adopted by different agencies and citation of the influential work of Donald Shoup on the impact of parking pricing on mode choice.

Professor Cervero is currently working on a project for the Transportation Cooperative Research Project entitled, "Transit-Oriented Development: State of the Practice, and Future Benefits." Results from the project will be available in September of 2003.

### **Parking Policy**

Leading work on parking policy, from a city planning perspective, has been done by Donald C. Shoup, a professor at UCLA. Professor Shoup writes on a broad range of parking policy issues, including minimum parking ratios, the cost of providing parking, parking benefit districts, cashing-out parking, and in-lieu parking fees. He emphasizes negative parking externalities and strategies to address them. He defines the central problem as not too many cars or too few spaces, but as the incorrect pricing of the existing parking supply. Were the cost of constructing, operating, and maintaining parking passed on directly to those using it, parking

demand would shrink. He notes, "parking itself appears to be free, but the cost does not disappear; rather, it reappears as higher costs for all other goods and services, especially housing" ("Cashing In" 24). Professor Shoup has investigated various methods of correctly assessing parking costs, such as treating the cost of providing parking as an employment benefit and offering the option of cash instead. He strongly condemns minimum parking ratios as "fertility drugs for cars" and asserts that they are grossly inflated ("High Cost" 12).

### **Parking Design**

Parking design is typically approached as matter of turning radii, stall dimension, and parking structure circulation. A few authors, however, have investigated it more thoroughly.

*Parking Gardens*, by Paul Groth, reconsiders the parking lot. He writes, "parking space is surely one of the most important and most underappreciated aspects of the present day urban environment" (130). He considers the etymology of "parking lots" and the implications for their treatment in the American city. Why "parking lots" and not "parking fields", "parking yards", or "parking gardens"? Groth contends that the lot is less imbued with meaning than the field, the yard, or particularly, the garden. He proposes that we should consider the parking lot as a form of urban garden, with cars standing in for plants. The parking lot displays many traditional elements of the garden, such as rows, color, and

repetition.

In *The City After the Automobile*, Moshe Safdie's sweeping examination of the automobile city, discussion ranges from traditional city organization to the environment of the office tower. He proposes the U-Car, a car-sharing program on a massive scale, in which all Americans use interchangeable, publicly owned cars. He also proposes the New Cardo, a linear central city organization, as a solution to the dead space of many downtowns. The New Cardo is oriented to the pedestrian at multiple levels along a major street. His discussion of parking in the city is comprehensive, but his proposals are perhaps more visionary than pragmatic.

In *Parking Spaces*, Mark Childs directly analyzes the relationship of parking to the urban fabric and suggests sensible design strategies for surface lots and parking structures. He discusses the nature of public space in general and proposes the 'car commons'. The 'car commons' is a parking lot specifically designed to allow uses besides parking, such as community festivals, recreation, or art. This simultaneously increases public space and improves the visual quality of the parking lot.

In the 1988 Columbus Carscape Competition, design firms from across the country competed to create the best public surface parking lot for the city of Columbus, Indiana, a Midwestern town well-known for its investment in major modern

architecture. The competition called for a 300-car lot to be built in three phases on 2.5 acres.

*Carscape: A Parking Handbook*, compiles the best of the competition. Entries were divided into five themes: multiple uses, landscaping, screens/trellises, parking patterns, and sculptures/monuments (37).

The competition jury commented, "there was a fascination with using parking lots as footprints of imagined buildings, as if the car were a bad dream which might go away" (35). A theme that runs throughout *Carscape* is the difficulty of making surface parking attractive on its own terms. Despite the intellectual attractiveness of Paul Groth's parking gardens, their reality is significantly less charming. The car is a firm reality of modern American society. Its effect on the city, however, can be nightmarish.

### III. THE CITY

#### **The City as the Pedestrian Environment**

As experienced, 'the city' is exterior. While the city contains individual buildings that maintain interior spaces, a mere collection of these interiors does not constitute a city. Rather, it is comprised of streets, sidewalks, parks, and rivers: a continuous, contiguous pattern of public and private spaces. The scale of many of these spaces is impenetrable to the car, which is restricted to streets, lots, and garages. And thus the sensory city is essentially the realm of the pedestrian. The pedestrian can smell fresh-baked bread or too-pungent fish, touch smooth marble columns or rough brick walls, and look down alleyways, in shop windows, or into the eyes of passersby.

By means of the automobile, the city may be easily accessed, but it is not easily experienced. Besides the increased accessibility it offers, much of the lure of the automobile is the ability to surround oneself, tortoise-like, with a portable, comfortable, personalized environment. To experience a city from within this shell is limiting. Smell, touch, and sound are nearly deadened, and sight is restricted. The speed at which an automobile travels also limits the ability of its passengers to perceive the city they are moving through.

#### **The Automobile and the City**

The introduction of the private automobile and the elevator enabled the creation of the modern

American city. While the elevator allowed buildings to rise ever higher, the automobile forced them further apart. Automobiles provided never-before experienced levels of transportation choice and freedom. As the private automobile was adopted as the transportation mode of choice, older cities began to adapt to it, and newer cities were built around it.

The popularization of the personal automobile created unprecedented demands on public space for private storage. American cities typically met the challenge by either retrofitting existing downtowns or building entirely new cities planned around the needs of the private auto. The former was accomplished by knocking down buildings to create surface lots or converting existing buildings to car storage. The latter is accomplished through land use regulation, development lending practices, and federal housing policy. In either case, the American city has been adapted to fit the car.

The power of the automobile to shape the city is considerable. Cars consume land for roads, interchanges, on-and-off ramps, and parking. Untamed, the automotive city will overtake the pedestrian city. Cars are bigger, louder, faster, and stronger than people. Once buildings are removed to accommodate the automobile, there are fewer and fewer places to walk to. The sensory experience of the pedestrian city then becomes one of smelling exhaust, listening to engines, and watching the traffic.



## IV. RESPONSES TO THE AUTOMOBILE CITY

### New Movements in Planning

On the whole, America is becoming less dense every year. We live in bigger houses, with bigger yards, and smaller families. While the rate of deurbanization may have slowed from its mid twentieth century peak, increasingly less dense development aggravates the problems of suburban sprawl, central city decline, and traffic congestion. Early responses to these problems included the federally funded Urban Renewal program, most active in the 1950s and 60s, and the construction of massive highways designed to increase the accessibility of aging downtowns. These programs were often harsh in their implementation and disappointing in their results. In the last 15 years, architects, planners, and engineers have increasingly focused on alternative solutions. Three ideas that have gained attention are Smart Growth, the New Urbanism, and Transit-Oriented Development (TOD).

**Smart Growth** is a package of land use, transportation, and design policies that are intended to concentrate growth and make efficient use of public facilities. It addresses sprawl through focusing on allocation of public resources and conservation of open space. Consequently, Smart Growth encompasses a much broader set of goals and principles than either New Urbanism or Transit-Oriented Development. Some states, notably Maryland, have embraced Smart Growth principles and written them into law.

The **New Urbanism** addresses sprawl by emphasizing the connection between design and quality of life. It is a form-based architectural and planning movement that aims to produce livable communities. The New Urbanists see the movement as a return to classic principles of urban design and traditional neighborhood design. New Urbanists espouse traditional neighborhood design through higher than average housing densities, walkable neighborhoods, traditional street grids, and a range of housing types. The potential applicability of the New Urbanism is limited by its strong association with particular architectural styles and high-end housing developments, however.

**Transit-Oriented Development (TOD)** similarly promotes walkable neighborhoods and traditional street grids, but is less architecturally prescriptive. TOD is based on the idea that dense, mixed-use development, centered around a public transit station, will reduce vehicle miles traveled (VMT) while maintaining accessibility, and improve land use and quality of life. TOD incorporates ideas from both Smart Growth and New Urbanism, but focuses on the relationship between transportation and land use. While TOD seems like a promising way to reduce sprawl and build community, there are issues that must be resolved before it can do this. One of these issues is parking.

## Transit-Oriented Development and Parking

Transit-Oriented Development proponents invoke place-based efficiencies. Simply put, the higher the density, the larger and more concentrated the local market, the wider the range of goods and services available within a convenient walking distance becomes. By concentrating a mix of uses within walking distance of the transit station, residents, employees, and visitors to a TOD will be able to minimize their automobile use while maintaining reasonable levels of accessibility.

While the physical design of a TOD may result in additional transit ridership and the reduction of vehicle miles traveled, its ultimate goal is the creation of a vibrant community. It is designed in direct opposition to sprawling, single-use suburbs, where driving is the only practical means of transportation. The clustering of uses and activities in a TOD allows and encourages people to get out into their neighborhood. Once there, the hope is that residents will take advantage of the increased opportunities for casual interaction.

There is also an environmental argument for TOD. When the early environmental movement encouraged us to “tread lightly on the land”, many interpreted this to mean extreme low-density, exurban development. The energy needed to service these remote locations and to commute to and from the workplace, however, is far greater than that required in an urban environment. Exurban, and often suburban, levels of density provide few or no alternative to the private automobile for

trips to the workplace, the school, the store, the soccer field, or the movie theater. Urban living may lack bucolic views, but it enables their preservation. Concentrated development patterns are key to preserving open space resources.

TOD is a difficult proposition in most American cities. It is, first and foremost, contingent upon a viable transit system. The creation of an active node at one station does not create a whole system. A single TOD may not be enough to entice drivers out of their cars and onto public transportation. Both origin and destination must be transit accessible before this can happen. TOD is assumed to require less parking than standard development. If station-area office buildings are to be constructed with half of the parking of their suburban cousins, one-half of the employees must be able to reach the office via alternate modes. Moreover, some 75 years of zoning practice has maintained low levels of density and high levels of parking, on the assumption that parking is a public good.

Most developers are reluctant to gamble on the construction of a relatively untried type of project. While they appreciate the potential for higher revenues afforded by a higher density development, they doubt its marketability. Developers and their financial backers do not all share the assumption that there is a niche market for higher-density, transit-accessible urban living.

Another factor limiting TOD’s market appeal is

its relationship to transit. The market for transit is much less firmly established than the market for the private automobile. If a TOD is to succeed, it must have a relatively high transit modal share<sup>1</sup>, and a lower percentage of trips by car. Lower parking ratios<sup>2</sup> represent a gamble for developers and tenants alike, who must be convinced that the transit system can augment accessibility sufficiently.

All of these factors indicate that some level of station-area parking is necessary for the health of both the transit system and the station-area, defined here as roughly the area within a quarter-mile radius of the station. Particularly along a fledgling or struggling transit line, station-area development may not be able to survive without sufficient parking. The provision of parking allows private automobile access. This access widens the catchment area of the transit system, making it possible for more people to use transit. It also supports station-area development, by widening the base of potential workers, shoppers, and residents. This in turn increases the chances for success of a greater range of uses. Determining what is “sufficient” parking is crucial to the success of a Transit-Oriented Development. Sufficiency could vary with time, as surrounding land uses and transit options change.

Residential units in a TOD are often built with lower-than-average parking ratios. While some tenants will choose to own fewer cars or to give up their car, other residents may simply

drive less often. Parking could still be required. Residential developments built without sufficient parking may have difficulty renting or selling units. If residents park in surrounding neighborhoods, tensions may develop.

The need to provide parking in a TOD creates conflicts. TOD is predicated upon the concentration of active uses within walking distance of a transit station. Land dedicated to car storage within this walking distance is removed from more active uses, like offices, shops, cafes, townhouses, or playgrounds.

Where the private automobile is the primary means of transportation, the higher the density becomes, the more parking must be provided. The need to provide parking limits both the overall density of the project and its affordability, by increasing land acquisition costs. In many cities, between 30% and 40% of the total land is occupied by highways, roads, and parking. The advantage of transit is that it allows density to increase without necessitating further construction of automobile infrastructure.

The inclusion of parking in a TOD can also degrade the quality of the pedestrian environment. A tenet of TOD is its ‘walkability’, or pedestrian-friendliness. Pedestrian-friendly environments are not only safe for walkers, they are pleasant and interesting as well. People will drive long distances to get out of their cars and walk around older, pedestrian-oriented neighbor-

hoods, like Savannah's historic downtown or New Orleans' French Quarter. The pedestrian-friendliness of a neighborhood is affected by parking, however. Providing parking increases air and noise pollution, increases safety hazards to pedestrians and bicyclists, and decreases the aesthetic appeal of the development. If some amount of parking is likely to be included in a TOD, these negative impacts must be reduced and mitigated wherever possible.

In short, if TOD is to become a viable option, zoning codes must allow it, public transportation must be able to support it, developers, financiers, and tenants must find it credible, and attractive developments must be designed. For all of this to occur, underlying assumptions about parking must be revisited.

### Parking Policy Assumptions

The assumption that parking is a public good creates a vicious cycle. Requiring parking typically forces buildings further apart, which reduces density and the effective provision of transit service. Reduced transit service limits accessibility, so that more parking is required. Requiring more parking further separates buildings, reduces transit services, necessitates more parking, and so on. Attempts to increase densities in this environment will be stymied by parking conflicts.

Development patterns are not alone in being affected by parking. The increased reliance upon

the automobile as parking increases and transit service decreases produces increased air quality and greenhouse gas emissions problems. The increase in the amount of paved land worsens run-off problems. And, last but not least, our dependence upon petroleum increases. As long as we unthinkingly assume that the provision of parking is a public good, we will fail to implement measures to address its very real negative externalities.

Changing our perception of parking sets up an opposing 'virtuous cycle'. Restricting parking increases transit use. Increased transit use makes increased transit service possible. Increased transit service makes it possible to restrict parking further, and so on. A virtuous cycle of this description has been taking place in Copenhagen, Denmark over the last 40 years. In Copenhagen, the city government has consistently eliminated traffic lanes and reduced parking supply by 2 to 3% each year since the 1960s, with the result that only 2,500 spaces remained in the city center in 1996 (Gemzoe 1998).

American cities may not be ready for change on the scale of Copenhagen. If our cities' decision makers – politicians, planners, developers, architects – were to reconsider the impacts of providing parking, however, they might make different decisions about land use regulation, parking policies, and public infrastructure. For example, many zoning codes today are written without thorough consideration of what they would allow



Central Square, Cambridge, MA. Sidewalks in Central Square are wide, lined with shops and shop windows, and have amenities such as benches, bus shelters, and bicycle racks. This creates a pleasant, active pedestrian environment.

if all parcels were fully developed. They often produce densities that are too low to support transit service, yet high enough to create traffic congestion. If we reexamine zoning with revised assumptions about parking, we may discover that minimum one-acre lots are no longer necessary, but sidewalks are.

The national hegemony of the automobile is not in immediate danger. How, then, can we integrate the automobile into viable, attractive TODs? To find out, I visited six transit systems throughout the United States. In the next section, I outline the current situation at these transit agencies vis-à-vis their planning and political environments, the quality of parking design, and plans for future station-area development.

## V. CASE STUDIES

### Massachusetts Bay Transportation Authority

The MBTA, which serves the Greater Boston area with heavy-rail rapid transit, light rail, commuter rail, regular and express bus and water taxis, operates within a peculiar parking environment. Boston's narrow, twisting streets and dense development patterns combine to make both parking and driving something of a challenge. Parking is further impeded by the federally mandated parking freeze, dating from 1975. After the 1973 passage of the Federal Clean Air Act, Boston failed to submit a federally mandated State Implementation Plan, which would outline measures to be taken to bring Boston's air quality into compliance with standards. In response, the EPA established the parking freeze. The parking freeze set a maximum number of parking spaces (35,503 in downtown Boston) to be permitted within five mapped areas. While the freeze is restricted to for-fee commercial parking spaces, it has contributed to high parking prices and relatively low parking supplies. The parking freeze may have indirectly contributed to Boston's relatively high downtown transit modal share.

Despite the parking freeze, MBTA stations are not entirely without parking. Park-and-ride, considered a relatively environmentally friendly form of parking, is exempt from the parking freeze. There are 23 park-and-ride lots serving the subway system; these are largely restricted to outlying areas. Although daily fees of up to

\$4 are charged at most lots, most fill with commuters by 9:00 AM. Wonderland Station and Alewife Station, both terminal stations with approximately 2,000 park-and-ride spaces each, exemplify the impact of large quantities of parking on the station area.

#### *Wonderland Station*

Wonderland Station, in the City of Revere, is the terminus of the MBTA's Blue Line, a heavy-rail rapid transit line with service to Boston's central business district and Logan International Airport. Wonderland Station is adjacent to Revere Beach, the nation's first public beach and home to historic pavilions and bandstands. The dramatic crescent-shaped beach draws large crowds in the summer months. If they arrive by public transportation, however, their first sight of Revere is far from scenic. Wonderland Station itself is surrounded by the classic 'sea of parking'. Over 2,000 surface parking stalls absorb commuters from the North Shore each morning. The parking lots and adjacent highways separate the station from both the city to the west and the extensive public recreation areas to the east. This long swath of parking has little interest for pedestrians during the day and is barren and threatening at night. While there are residential neighborhoods to the northwest and southwest of the station, there are no easy walking paths to the station.

The opportunity at Wonderland is that surface parking represents a relatively small investment,



Wonderland Station, Revere, MA. The transit station is the dark square at center; surrounding outlined parcels are all surface parking. Notice how the quarter-mile around the station, indicated by the large circle, is almost entirely filled with parking.

and most of the land is in public control. Were Wonderland's 2,000 spaces contained in parking structures, the MBTA might be understandably reluctant to knock them down and develop the land. Surface lots are often assumed to be interim uses, as the costs of redeveloping them are fairly low.

Despite Wonderland's development potential, no action has been taken to develop the surface parking lots. The cost of building parking structures sufficient to accommodate 2,000 commuters and support any development is immense. As can be seen at Alewife, designing such a structure to fit into a neighborhood is extremely difficult. Wonderland's proximity to Revere Beach raises the design stakes even higher. Unregulated development there threatens its assets.

### *Alewife*

The extension of the Red Line to Alewife in 1984 sparked the revitalization of Davis Square and Porter Square as livable, dense, transit-oriented neighborhoods. Results were less appealing, however, at Alewife. For a terminal station, Alewife itself is efficient in its land use. Stacking 2,000 cars in a garage is preferable to spreading them out over some 14 acres. Alewife Station has been praised, in *Architectural Record* shortly after its completion, and later by Peter Rowe. Rowe writes, "there is considerable engagement, both literally and metaphorically, between building and highway...the stark contrast between

the building and the adjoining conservation area heightens the legibility and presence of both public realms" (264).

Alewife Station, which looms next to Route 2 and a few scattered fragments of development, exemplifies good architectural intentions gone wrong. Efforts were made to reduce the impact of its massive scale by incorporating first-floor retail, glass, and public art. The retail, however, has struggled, and the glass and art are simply insufficient to combat so much concrete. Surrounding development has been delayed by the discovery of asbestos on former industrial lands adjacent to the station.

The design of Alewife Station physically expresses its automotive orientation. The architect, Harry Ellenzweig "pulled the heart of the complex – that is, the station proper – outside of the garage, bringing its relative smallness nearly to the edge of the parkway along which most people drive to approach it" (Anderson 72). It seems reasonable to design Alewife, a terminal station with over 2,000 park-and-ride spaces, with an eye toward automobile access. In designing the station to address Route 2, however, Ellenzweig did not fail to consider other modes of access. A secondary station headhouse, intended to encourage pedestrian access, juts out towards existing residential development. Today, this entrance is foreboding and rarely used<sup>3</sup>. Pedestrian pathways that are completely separated from other traffic require relatively heavy



Alewife Station, Cambridge, MA. Notice how the garage 'turns its back' on the bike trail.

volumes of foot traffic to create a feeling of security. The Minuteman Commuter Bikeway, an 11-mile bikeway that begins at Alewife and continues on to Bedford, MA, intended to encourage commuter cycling, halts abruptly at the garage, instead of connecting directly to the rail station. More research would be needed to determine whether this is due to poor planning on the part of Alewife's designers, those of the bikeway, or for some other reason. In any event, would-be bicycle commuters are not encouraged to cycle into the station. Despite the potential for connections, then, Alewife fails to connect to the Minuteman Bike Trail, adjacent wetlands, or pre-existing neighborhoods.

### **Bay Area Rapid Transit**

Bay Area Rapid Transit (BART), a largely elevated heavy-rail rapid transit line, opened in the 1960s. While stations within the City of San Francisco, downtown Oakland, and downtown Berkeley are integrated into the urban fabric and many patrons walk to the station, the bulk of the system operates more like traditional commuter rail lines. Stations are far apart, service is infrequent but regular, and free parking surrounds suburban stations.

There is a longstanding policy of free parking at BART stations. The Board of Directors is reluctant to reverse the policy, which appeals to their suburban constituents. There are over 40,000 free parking spaces throughout the BART system, mostly in surface parking lots. In January of 2001, the Board of Directors voted to

allow charging for all net new parking created. All spaces existing prior to that date, however, are to remain free. In tandem with a policy of one-for-one replacement of any parking displaced by development, this is a serious impediment to TOD.

Nevertheless, there are redevelopment proposals at 15 of BART's 42 stations and efforts are underway at a handful of BART stations, including Fruitvale and Pleasant Hill. At Fruitvale, a non-profit community group leads the effort. At Pleasant Hill, the leadership is from the private sector. Parking issues have been major issues in the progress of both developments.

### *Fruitvale*

Fruitvale, a heavily Latino community south of downtown Oakland, had seen years of disinvestment in 1990, when BART first proposed construction of additional park-and-ride capacity there with a new garage. There are currently 1103 parking spaces in surface lots at Fruitvale; the 1990 proposal would have increased that number by 488. The resulting 3-story garage would have been located on a preexisting surface lot. While park-and-ride users supported the increase in parking, local residents felt differently. Community members objected to the further separation of the station from the neighborhood, to the blighting aesthetics of an increase in parking, and to the potential increase in crime that the parking structure could create. In response, the community proposed a TOD at Fruitvale. Under the leadership of the Spanish-



Speaking Unity Council, a neighborhood non-profit community development group, the counterproposal eventually evolved into the Fruitvale Transit Village.

The Fruitvale Transit Village is slated to include health care, a library, a senior center and daycare, retail, office, and housing on over 15 acres in Spanish-style architecture. A pedestrian plaza connects the development to the transit station. The Transit Village is conceived of as a way to revitalize the neighborhood, to attract commuters into Fruitvale's commercial district, to provide much-needed affordable housing and community centers, and even to increase BART ridership.

The Fruitvale project has a long and rocky history. The need to replace all BART parking on a one-for-one basis hurt its financing prospects. To reuse the former surface lots for active development, BART parking had to be relocated in a much more expensive garage. Without the ability to use parking fees to cover the construction, operation, and maintenance of the garage, alternate sources had to be found. While a for-profit developer building a high-end project might have been able to cover the financial loss of the BART garage, the Unity Council is trying to build community-oriented projects and affordable housing. The project is finally being realized with the aid of 22 funding and financing partners, largely foundations and local governments. Funding for the parking garage came from Federal Conges-

tion Management funds.

### *Pleasant Hill*

Pleasant Hill, in wealthy and fast-growing Contra Costa County, has 3,450 parking spaces for 6,400 riders a day, many of whom are suburban and exurban commuters. Since BART was first extended to Pleasant Hill, the development of the station area has been debated. A specific plan for the station area was adopted in 1983. Much of the land included in that plan, which was designated County redevelopment land, has been developed as office and multi-family housing in the intervening years. Pleasant Hill lacks a coherent center, however. Contra Costa County planners now hope that the Pleasant Hill TOD will fill that role.

A 1995 proposal to build a regional entertainment center at the station was warmly received by financial backers and the transit authority, but strongly opposed by the community. Local residents feared the presence of an 'undesirable element' if the development was regionally oriented. In reaction, local lawmakers amended the 1983 specific plan to reduce the development potential by one-third.

Parking has been a major issue at Pleasant Hill, as well. Unlike Fruitvale, where increased parking was opposed, there is active support for increasing parking at Pleasant Hill. In reaction to development proposals, the Diablo Valley Com-



International Boulevard, Fruitvale, CA. Fruitvale has participated in the Main Streets, USA program to help it revitalize this traditional commercial corridor. Note the relatively small scale of the area. The proposed increase in park-and-ride spaces could have significantly impacted its character.

muters' Alliance formed to safeguard the station's parking supply. The Alliance, with some 2,000 members, opposed any loss of parking at Pleasant Hill. BART policy prohibits the loss of BART parking in station-area development. In addition to its 3,450 permanent spaces, however, Pleasant Hill was also home to 581 temporary spaces, conceived of as an interim use on a parcel of land slated for conversion to green space. Much of the opposition to station-area development focused on the removal of these spaces.

The standoff was broken with a six-day design and planning charrette attended by 150 people. A charrette is a form of accelerated design process, where an entire project can take shape in a matter of days, through citizen meetings, group planning, and planning and design games. Charrettes can be an effective way to get community input in an urban design project, when members of the community are not formally trained in design. The Pleasant Hill charrette, which cost \$500,000, was funded by the developer, Millenium Partners. It was a surprising success, resulting in community buy-in and the first real progress in years. The current proposal calls for office, residential, locally oriented retail, and civic uses. The charrette report was accepted by the Board of Supervisors in December, 2001 for transmittal to the developer. One of the major issues of contention, the loss of the temporary parking, was resolved by replacing those spaces as paid parking. This is allowed, since these spaces are not a

part of the BART permanent, free parking supply. Contra Costa County planners noted, "as part of BART's strategic planning effort over the past few years, the District has determined that it should emphasize access of all modes, not just the single-occupant automobile." (Contra Costa) This plan brings the total number of spaces dedicated to BART patrons to 4,031, a real challenge in terms of pedestrian-friendly design.

One strategy is to locate all BART replacement parking, plus additional parking to support development in a massive parking structure abutting the BART right-of-way. So as to not negatively impact the TOD, two sides of the structure will be wrapped with four stories of apartments.

Another strategy involves the elevated guideway structure, which currently divides the station area in two. The charrette report proposes integrating the station into surrounding development and making the pedestrian underpass brighter and more welcoming.

### **Maryland Transit Administration**

The Maryland Transit Administration (MTA) manages five transit lines: heavy rail, light rail, commuter rail, bus, and neighborhood shuttle. These primarily serve the Baltimore area, with some connections to the DC area. While its suburbs are flourishing, the City of Baltimore has struggled to survive. Baltimore's efforts to revitalize its downtown are well-known; the Inner



Pleasant Hill Station today, with existing parking garage. (Photo: Lennertz Coyle Associates)



The parking garage, as it could look after being 'wrapped' with apartment buildings. (Photo: Lennertz Coyle Associates)

Harbor is doing fairly well as a tourist attraction. Nevertheless, severe problems with poverty, drug addiction, and disinvestment remain. According to 2000 US Census data, Baltimore's population decreased by an average of nearly 1,000 people each month during the 1990s.

This creates challenges for the MTA. How can Baltimore support transit without the necessary population densities? The city's competitive disadvantage with reference to the suburbs restricts the usefulness of its transit system. The light rail line, in the words of one MTA staff member, "doesn't go anywhere".

This creates a situation in which parking is an important station access mode. The MTA currently provides some 10,623 parking spaces at 20 lots dedicated to heavy rail and light rail, and many more for commuter rail and bus. The only MTA parking garage is at Baltimore Washington International airport, and it's also the only place that a parking fee is charged. Low parking prices in the City of Baltimore, relatively light traffic congestion, and the limited utility of the transit system make charging for park-and-ride extremely difficult. Fully one-half of the Metro stations have dedicated parking spaces, reflecting the importance of parking to Metro's current operations.

Like most transit agencies, the MTA is dependent upon the decisions made by local jurisdictions regarding station-area planning; little of it happens currently. MTA staffers hope to encour-

age station-area planning in the future by following Seattle's lead. Seattle's Sound Transit agency, which is implementing a new light rail line, partnered with the municipal planning agency and funded a comprehensive station-area planning initiative.

The MTA is in a unique position as the transit agency for the City of Baltimore and the State of Maryland. It is also unique in that Maryland passed a series of Smart Growth laws during the 1990s. One of these programs is the Smart Growth, Smart Transit program, which provides grants for transportation related improvements. The Smart Growth, Smart Transit program is designed to support TOD through pedestrian and transit improvements. Similar Maryland programs include the Transit Station Development Incentive Program, the Transportation Enhancement Program, and the Retrofit Sidewalk Program. Dozens more programs target the preservation of rural areas, environmental conservation, economic revitalization, etc. With such a supportive legislature, and such a limited market for transit, how is the MTA doing vis-à-vis TOD?

#### *Symphony Center*

The MTA's first urban TOD project to be completed is the Symphony Center development at the Cultural Center light rail stop in Baltimore. The project is sited on a 6-acre parcel acquired during the construction of the light rail system, outside of the traditional downtown. At that time,

the parcel was occupied by an abandoned office building, across from the Meyerhoff Symphony Hall.

Symphony Center is uninspired in its architecture and only vaguely transit-oriented in its site plan. The 650-car parking structure, funded by the state, abuts the light rail line. The project is not particularly dense. While nearby state office buildings, a legacy of 1950s and 1960s urban renewal projects, are traditional modernist towers in parks, Symphony Center's office buildings restrict themselves to three floors. There are plans to include a residential tower in the future, which would increase the overall density and decrease the overall parking availability.

Symphony Center is an example of good intentions and poor market prospects. Baltimore's light rail line has neither the ridership nor the immediate potential ridership to serve a dense, urban, transit-oriented development. While the MTA should be commended for trying to encourage mixed-use infill development, Symphony Center appears a work in progress.

### **Washington Metropolitan Area Transit Authority**

The Washington Metropolitan Area Transit Authority, better known as WMATA or Metro, operates bus and rail systems in the metropolitan DC area, which includes the District of Columbia; Arlington, VA; Fairfax, VA; Alexandria, VA;

Falls Church, VA; Fairfax, VA; Montgomery County, MD; Prince George's County, MD; and Rockville, MD. Metrorail opened in 1976 with 4.2 miles of track. The next 25 years were spent implementing the planned system. At the beginning of 2001, the original 103 mile, 83-station system was completed.

#### *Parking Policy and Station Access at Metro*

Park-and-ride is an important component of Metrorail station access. About 1/3 of riders arrive at Metro by automobile, with an average occupancy of 1.1 per vehicle. The demand for Metrorail parking is much higher than the supply and seems likely to continue to be. A 1972 study found unconstrained demand for a theoretical supply of 100,000 spaces, at a time when there were fewer stations than there are today (Habegger). While demand will never be met, there are 52,000 parking spaces throughout the system and more under construction. Metrorail has always charged for parking; on opening day in 1976, it cost \$0.50 a day to park. Parking fees today range from \$1 to \$2.25.

Metrorail parking is funded and expanded through a surcharge on park-and-ride fees of \$.75 to \$1.25 on top of a base fee of \$1 outside of the beltway and \$1.25 inside of it. The precise amount of the parking surcharge is negotiated with each jurisdiction. The parking surcharge program began in February 1989. Before implanting the surcharge, WMATA tested it with



Symphony Center in Baltimore. Note the relative sizes and positions of the garage and the office building.

a successful demonstration program. A public meeting was held and the Board of Directors agreed on a maximum surcharge of \$4 a day. While the current fee is much lower, this decision gave WMATA the flexibility of raising the fee without returning to the public process.

Given the importance of park-and-ride to Metro-rail, at least one staffer interviewed is concerned that TOD projects could interfere with station access. Ronald Habegger, Manager of Parking Operations at WMATA, stated that TOD can be detrimental to rail, by reducing station access across all categories. Poor design can easily complicate or substantially harm bus access, kiss-and-ride, paratransit<sup>4</sup> and even cycling and walking. All of the vehicular modes require sufficient space for turning, dropping off passengers, and picking them up. As a rough guideline, he suggests that one-quarter of the site be dedicated to station access.

#### *Joint Development*

Joint development refers to projects done by the transit agency in partnership with a private developer. Metro has been in the forefront of joint development projects in the United States. To date, 54 joint development projects on Metro-owned land have been approved by the Board of Directors. While Metro has a one-for-one parking replacement policy similar to BART's, Metro has more flexibility to increase, decrease, relocate, or fund the replacement parking. All land use

and design decisions, including zoning, land use, parking supply are made by the local jurisdiction. Metro recently adopted TOD guidelines for project evaluation:

“Promote Transit Oriented Development (TOD) by giving priority to Joint Development proposals which contain the following smart growth development principles; reduce automobile dependency; increase pedestrian/bicycle originated transit trips; foster safe station areas; enhance surrounding area connections to transit stations, including bus access; provide mixed uses development, including housing in compliance with local regulations; and the opportunity to obtain goods and services near transit stations and offer active public spaces” (WMATA 6)

Joint Development projects are also expected to generate ridership, produce revenue, and support the property tax base of local jurisdictions. While Joint Development has an admirable track record of getting projects built, the focus has been revenue production, not ridership generation or TOD. This focus, combined with meaningful TOD evaluation, is not necessarily a problem. By acting as a for-profit branch of a non-profit organization, Joint Development staffers create projects that produce over 11 million dollars in revenue each year<sup>5</sup>. The actual guidelines used by the Joint Development office are unavailable to the public and thus could not be analyzed for

efficacy.

### *Local Planning*

Metro takes a hands-off approach to station-area land use planning, leaving all land use decisions to the individual jurisdictions. While this approach is politically necessary, it means that the land use efficiency, and thus the ridership, at each station depends upon the transit-friendliness of the city or county in question.

Arlington County, Virginia has made a concerted effort to concentrate new development around its 7 transit stations in two corridors as part of a strategy to manage growth while preserving the attractiveness of existing lower-density development. 46,474 residents, 24.5% of the total Arlington County population, are now located within ¼ mile of a transit station (Arlington County website). Arlington County's focused growth approach has been quite successful. In 2001, approximately 70% of residential starts and completed units and 95% of office starts were within the Metro station area (PIR 52). While the station areas range in design quality, efforts have been made to reduce parking supplies through maximum parking ratios, incentivize pedestrian amenities, and ensure a mix of uses. From a financial standpoint, the project has been a huge success; the Metro areas, just 10% of the total land, produce 50% of Arlington's total tax revenue (Unity Council).

### **Chicago Transit Authority**

The CTA is the second largest transit provider in the United States. The CTA runs subways, elevated trains, and buses throughout the Chicago area. Two sister agencies, Metra and PACE, control commuter rail and suburban buses, respectively.

The CTA maintains parking lots at relatively few of its transit stations. Of the CTA's 143 stations, only 14 have parking. Although the CTA itself was not created until 1947, portions of its rapid-transit system, once privately operated, date from the turn-of-the-century. Consequently, many CTA stations were not designed with the private automobile in mind. They are well integrated into their neighborhoods and largely accessed by foot or bus. Park-and-ride is available at terminal stations and some suburban stations. Many of these lots are owned and managed by the municipality that they are located in; parking prices are set according to local preference.

With 6,095 spaces, the CTA has less than 12% of the parking capacity of WMATA, yet their daily rail ridership is nearly identical. Much of this is attributable to older development patterns in Chicago. These development patterns display many characteristics of TOD: higher densities, mixed uses, and a walkable street grid.

Chicago's development patterns are a product of its history, not of its zoning. While Chicago's



current zoning code does not disallow transit-supportive development, it does little to specifically encourage it. Consequently, the quality of each station area depends largely upon its age, and partly upon luck. Transit-supportive development patterns are generally accepted and desirable in Chicago neighborhoods, but several newer stations have fallen victim to unfortunate land use choices.

In cities with established transit systems, transit, and transit-supportive development, are sometimes taken for granted. Cities are not static, however. Older systems may need coordinated land use regulation just as do newer ones. The current zoning ordinance has not been comprehensively revised since the 1950s; a Zoning Reform Initiative is underway. If Chicago's revised zoning code addresses the special qualities of station areas, its transit system could thrive into the next century.

### **Tren Urbano**

San Juan, Puerto Rico has the highest vehicle density per mile of paved road in the world (Izquierdo 10/12/2001). This results in some of the highest congestion levels, as well. San Juan's mountainous topography and limited land essentially precludes major highway construction. A plan to address growing traffic congestion through the reintroduction of rail transit service (absent since the 1950s) has existed in some form

or another since the 1960s. In the early 1990s, the Federal Transit Administration approved the project and provided major funding for it. Phase I of Tren Urbano is due to open in September 2003. Phase I will consist of 10.6 miles of elevated, at-grade, and below-grade track. The bulk of the alignment is on an elevated concrete structure, similar to that of BART.

The Puerto Rican Highway and Transportation Authority (PRHTA) has purchased land in excess of its needs around several stations. Approximately 5,000 park-and-ride spaces in surface lots are planned for Opening Day. Plans are under development to later convert these lots into joint development sites. Several issues remain unresolved.

### *Auto Dependency in San Juan*

High levels of auto dependence, high parking ratios, a price ceiling on commercial parking fees, and 'parking entitlement' are all operating against the development of transit-friendly neighborhoods. While San Juan is home to 37% of the island's total population, it has 63% of the jobs. This imbalance causes huge unidirectional peak-hour traffic flows. The surge of commuters pouring in each day from outlying areas causes delays, wastes energy, and makes the provision of parking an extremely important development issue.

Existing public transportation is low in quantity



Chicago's current zoning ordinance allows incompatible uses in station areas, such as this gas station immediately adjacent to the Orange Line Pulaski Station. On the other side of the tracks, an auto body shop and two car dealers are located.

and in quality. Puerto Ricans associate public transit with aging, infrequent buses and aging, infrequent jitneys, known as publicos. Either service requires a long wait and a long walk under the hot sun at the edges of San Juan's streets, where sidewalks are narrow, dirty, or nonexistent. Traffic is heavy, and crosswalks are rare. Cars are not only a status symbol, they are often the only practical means of transportation.

Parking ratios in San Juan are high even by U.S. standards: 5-6 spaces per 1,000 sq ft of office development; 3-4 spaces per dwelling unit. The relatively sudden introduction of the private automobile to San Juan, combined with the government's reluctance to finance municipal parking, may have lent early parking shortages a sense of urgency, resulting in these high parking ratios. Insufficient public parking, in lots and on streets, forces developers to accommodate all possible parking demand on their own property. This further encourages auto dependency by pushing developments further and further away from each other, making walking even more difficult.

The cost of all this auto dependency is significant: while average incomes in Puerto Rico are lower than in the rest of the United States, the costs of car ownership are just as high or higher. Having a viable alternative to driving could greatly improve quality of life.

Trying to minimize the financial burden of auto ownership, the Department of Consumer Affairs

has set a price ceiling for commercial parking fees. The artificially low parking prices encourage single-occupancy driving and discourage the use of park-and-ride facilities while simultaneously having the effect of reducing the overall commercial parking supply by limiting its profitability.

Another result of the regulation of parking prices is to encourage the sense of parking entitlement in the San Juan area. Cars are parked anywhere and everywhere – double-parked, triple-parked, and especially on sidewalks. Locals are used to paying little or nothing to park wherever and whenever they like. The hugely successful mall 'Plaza de las Americas' and its parking lots occupy roughly two-thirds of the area of the whole of Old San Juan.

Recognizing the strength of the car culture in Puerto Rico, in 1999, Tren Urbano nearly doubled the number of planned park-and-ride stalls to 5,000. With daily ridership forecasts of 100,000 passengers per day, however, park-and-ride will account for only 5% of station access.

If stations are to be accessed by other means than private auto, publico, or bus, a pedestrian-friendly environment must be created. One important step towards this is reclaiming the sidewalks from parked cars.

Insufficient public parking has created a widespread practice of parking anywhere and every-



San Juan's sidewalks are frequently occupied by automobiles. (Photo: George Proakis)



where, creating a large informal parking supply. If existing parking regulations are to be enforced and even strengthened, the available parking supply will be greatly impacted. While existing legal spaces may turn over more quickly and thus increase the supply of official parking; the large number of unofficial spaces will disappear. Enforcement must appear in tandem with a municipal parking program, or local businesses will suffer. If this is allowed to happen, Tren Urbano's political support base may be quickly eroded.

#### *Planning Initiatives in San Juan*

The Puerto Rican Planning Board is currently developing land-use plans for the 500-meter area around the stations. While the plans reflect the kinds of transit-supportive land use initiatives implemented in Seattle, Portland, etc, their success in the Puerto Rican environment remains to be seen. Preliminary plans are slated to include maximum parking ratios, mixed-use districts, pedestrian improvements, design overlays for public spaces, and mandatory build-to lines to create a consistent streetwall.

Developers interviewed stated that mixed-use is a hard sell in the Puerto Rican market; only ten projects have been completed to date. Residential development in particular is difficult to combine with other uses, due partially to heightened real and perceived security needs in San Juan. Strip-mall parking lots are guarded; private homes are

guarded and their windows are barred. Mixing residential development with more public uses is a concern to many Puerto Ricans. This resistance to mixed-use is reinforced by the separate office and housing lending departments at Puerto Rican banks, complicating the development of mixed-use projects. According to Luis Garcia, a member of the Puerto Rican Planning Board, the market will demand only office development at most stations. He hopes to encourage a broader range of uses through a mixture of carrots and sticks.

#### *Tren Urbano Parking Policy*

Tren Urbano's parking policies are yet to be decided. Early on, the decision was made to construct surface parking lots instead of parking structures, so that TOD could be integrated later. The question of charging for park-and-ride spaces is still undecided. The low cost of CDB parking and the strong sense of parking entitlement in San Juan makes charging for parking a difficult proposition. Tren Urbano planners indicated that their preference would be to have all park-and-ride spaces retained in any joint development project, and total number of spaces increased, if possible. This feasibility of this scheme would be greatly improved by charging for parking.

#### *Joint Development*

PRHTA is already developing preliminary plans for station-area joint development projects. These

are intended as demonstration projects, revenue generators, and ridership builders.

One concern is that of premature station-area development. The current administration has expressed its preference for 'fast-track' implementation of joint development projects. Until the system has been fully operational for some time, however, it will be difficult to assess the market for TOD. Projects built too early in Tren Urbano's lifetime may either be too suburban in design or overly ambitious. If the latter projects were to fail, other developers may become wary of TOD projects. The first projects to be built may well set the standard for future development. A moderate approach and a flexible design will be necessary for early developments.

Given the high levels of auto dependence, the market resistance to mixed use, the poor quality of the pedestrian environment, and the long time frame for the build-out of the entire Tren Urbano system, the feasibility of TOD around the Phase I stations is questionable. The excitement that the project has occasioned in the Puerto Rican planning, architecture, and development communities may be its saving grace. If local government and the PRHTA continue to be committed to progressive, transit-supportive policies, the Puerto Rican development model may change dramatically.

## VI. LESSONS FROM THE CASES

### The Impact of Parking on the Station Area

Park-and-ride lots or garages often support the central city at the cost of the local station area. Where no neighborhood exists, this is fairly easy to justify. Storing cars outside of the city allows for higher densities of employment and activity within the city itself. It allows for the support of regional cultural institutions and walkable cities. The park-and-ride area, however, gains cars and loses people. A park-and-ride system allocates benefits primarily to the city and costs to the station area.

The basic design problem in station-area parking is car storage. Whether you spread cars out horizontally or stack them up vertically, car storage is neither particularly interesting nor attractive. When storage is located next to the transit station, as it so often is, the needs of the drivers are at a higher priority than the neighbors or those who chose alternate modes of station access. The conflict between the needs of those who live and work in the station area and those who park there is clear.

Commuters tie up local roads during peak hours while doing little to contribute to the neighborhood. They typically hop in their cars and drive off, without paying local taxes or shopping in local stores. They may 'poach' parking spaces intended for residents, workers, and visitors to the neighborhood. While communities like Fruitvale (BART) should theoretically welcome the

arrival of park-and-riders, whose median household income is higher than that of residents, Fruitvale actually opposed parking expansion.

Transit stations with surface parking lots, like Wonderland (MBTA) or Fruitvale, are less integrated into their surrounding neighborhoods. By definition, a parking lot has no interest for non-driving patrons. The existence of the lot lengthens the distance that a pedestrian has to walk before reaching his destination. It visually and physically separates the station from the neighborhood. Fenced-in surface lots are particularly annoying to the pedestrian, prevented, admittedly for his own safety, from taking a short cut through the lot. The entrance to a parking lot or structure is difficult and unpleasant to cross, particularly during peak commuting hours. It is a hazardous environment for a pedestrian or cyclist by day and a barren, threatening one by night.

While a parking structure is usually more compact than a surface lot, it can be just as unpleasant. Parking structures are often architecturally brutal traffic generators. Security, both perceived and real, is more of an issue in the enclosed, solitary environment of a parking structure. Criminals can hide behind parked cars and concrete pillars and are even harder to see due to typically low lighting and dark surfaces. One study found that "in 1992, parking facilities were the third most frequent place of occurrence for violent crime (rape, robbery, assault)" (Childs 115).

## Land Use and Station Access

Heavy-rail rapid-transit systems, which make up the majority of transit systems within in this study, have extremely high capacities. To operate efficiently, they require high capacity station access systems. In theory, patrons may access transit systems by walking, cycling, feeder bus lines, kiss-and-ride (private automobile drop-off), or park-and-ride. In practice, their options are limited by the development patterns at their origin and at the transit station.

Land use decisions affect station access decisions. Development patterns in Chicago, for example, allow patrons to access the transit station by walking or by a feeder bus. An examination of station access data from Metra, CTA, and BART reinforces the importance of development patterns in station access, and thus parking demand. Commuter rail service is infrequent and strongly oriented to the Central Business District – suburban commuter. Densities around Metra station areas are fairly low and land uses are typically less mixed than in an urban setting. A rapid-transit system such as the CTA serves a higher density, mixed-use, urban community. BART's service area is quite urban in places and suburban in others. While over 55% of Metra patrons drove alone to the station, only 11.1% of CTA patrons did (RTA iv). 25.4% of BART patrons drove alone in a 1998 survey, reflecting its hybrid commuter rail – rapid transit nature (BART Station Profile Survey).

## Stakeholders

### *The Role of the Transit Agency*

None of the transit agencies studied have been able to perfectly reconcile parking and development. Indeed, none of these agencies have the power to do so. Consistently, transit agencies have relatively little control over land-use planning in the station area. And perhaps rightly so: their task is to provide transportation, not to subsume the functions of local government. Leaving station-area planning in the hands of local governments, however, may negatively impact the region as a whole. Transportation is a regional issue: so are the potential benefits of TOD. Local authorities are often understandably unwilling to sacrifice any local interests for the good of the region.

An agency that can look to the interests of the region as whole is necessary to maximize the effectiveness of regional infrastructure like transit. Regional planning agencies, where they have the power, can fill that role. The Puerto Rican Planning Board is a good example of this kind of agency. The Planning Board has the power to control land-use for the entire island; only municipalities of a certain size may elect to create their own plans, and these must be approved by the Planning Board. The Planning Board has removed control of station areas from local municipalities and is engaging in progres-

sive planning there. Most regional planning agencies, however, lack this kind of authority. With only the power to suggest policy, not to implement, their plans are easily ignored.

Is there a potential role for the transit agency in regional transportation and land use planning? Such a role could not only inform the transit agency's own decision making, but allow it to affect regional land use planning through its knowledge and experience. Admittedly, many transit agencies today have little interest in station-area land use, believing it to be outside the scope of their interest. Others pay more attention to the relationship between land use and transportation ridership, but believe they have relatively little power to affect it.

Transit agencies currently have the option of affecting station-area land use in two ways: by development choices on their own property and by lobbying for a transit-supportive regulatory environment. Some agencies, such as WMATA, hope to support efficient land use by providing technical support to local planning groups. Others, such as Seattle's Sound Transit, partner with the municipal planning department and fund station-area planning. At Tren Urbano, in-house planners are active participants in the station-area planning process.

The transit agency should be made a more active participant in the station-area planning process. A range of measures could be taken. The transit

agency could be given the power to comment on site plan or design reviews, to have influence in shaping the criteria for those reviews, and generally to have a stronger voice in land use planning. Simultaneously, the transit agency should be held accountable for its own development choices and their impact on land use and development.

### *The Role of the Community*

Neighborhood support for a TOD project is crucial. At Fruitvale, community support for the transit village carried it through long years of funding negotiations. At Pleasant Hill(BART), a lack of community support held up station-area development for six years. While development appears to be moving forward at Pleasant Hill, other TOD-style proposals have met a quick death at community meetings. Low-density development in single-use neighborhoods has been the American paradigm for the last 50 years. Some communities are simply not ready to accept higher densities and mixed uses. Neighbors may be concerned about traffic congestion or property values, or simply be wary of change.

### *The Transit Agency as Developer*

Especially since new movements in planning have been so widely debated, planning departments and transit agencies may be under pressure to pay at least lip service to them. When transit agencies get involved in land development, however, it is important for the agency to have a clear

understanding of its own motives in so doing. Given the extreme disparities between operating costs and farebox revenues for most transit systems, joint development projects may be the only reliable revenue-generator in the transit authority's portfolio. While the profit to be made in operating joint developments can help keep the agency afloat, it may also distract from the agency's primary mission: transporting people. Joint development projects run the risk of being 'transit-adjacent development', located next to a transit station but unlikely to be accessed by transit users or to generate ridership. Without stringent guidelines for minimum transit modal share or maximum parking ratios for joint development projects, transit agencies may profit in the short term but preclude future opportunities for more transit-supportive growth. It is important, too, to recognize that the money brought in by joint development projects may be incidental in comparison to the agency's total budget. For example, the revenue that WMATA's well-known Joint Development Department brings in constituted about 0.6% of the 2002 budget.

### **The Economics of TOD**

TOD is still an untested development form in most markets. While station-area development in Arlington, VA, has been hugely successful, its success may not translate to other cities. In Arlington, the demand for office space was nearly insatiable during the 1980s and 1990s; this demand was effectively channeled into the

station area. Arlington's experience is not the rule. Even if a developer with confidence in the success of TOD comes forward, the project will be difficult to implement. Lenders are typically wary of financing projects with less than standard quantities of parking and higher densities, particularly in markets where such development does not already exist.

The development company with an interest in TOD and the resources to do it well is rare. Relatively few developers have experience with it; fewer still are able to command the resources to do a first-class job. Pleasant Hill has been lucky in that the developer, Millennium Partners, has the extensive resources to fund charrettes, wrap parking structures with housing, and generally finance a high-quality development. One developer interviewed, Christopher Hudson of Berkeley, California-based Panoramic Interests, stated that Panoramic Interests was able to do TOD projects because they had the security of a long-term investor. While short-term investors might be wary of nontraditional projects, which could be slow to turn a profit, a long-term investor can look at the "big picture".

Few developers have the luxury of a long-term investor. To implement a TOD, which is difficult to finance by traditional means, funding from many sources must be pulled together. These may include Federal Congestion Management funds, state programs like Maryland's Smart Growth, Smart Transit program, Community

Development Block Grants, and many, many others. The Bay Area's Metropolitan Transportation Commission (MTC), the metropolitan planning organization, sponsors one innovative program. The MTC's Transportation for Livable Communities (TLC) program is the only one of its kind in the United States. Through TLC, planning and capital grants are made for TOD and housing in station areas.

Another financial tool is Fannie Mae's Location Efficient Mortgage, which allows those buying a home within walking distance of transit to 'stretch' their debt-to-income ratio, on the assumption that residents of these areas will own fewer cars and thus have more income in real terms. Essentially, this allows borrowers to qualify for a larger mortgage.

The experience of Fruitvale shows that pulling all of these sources together to realize a project requires time, commitment, and a smattering of luck. Fruitvale also raises issues of replicability; not every neighborhood has a dedicated community development corporation like the Unity Council. For the TOD financing situation to improve, successful demonstration projects, in a variety of locales, are necessary.

### **The Economics of Parking**

Parking may be provided to the user as a free amenity, or for a fee as a commodity. When a transit agency embarks upon the provision of parking, it must decide how to characterize this service.

Americans are a loud, proud, empowered people. We expect free speech, cheap food, and free parking. Providing parking, however, is not free. Land must be acquired, the lot or structure must be constructed, and routine maintenance must be performed. Transit users pay for transit because they are a relatively politically insignificant minority and they have always paid for transit. Drivers tend to feel that they pay for their transportation through the significant costs of purchasing, maintaining, and insuring their vehicles. They often feel that paying to operate or store that vehicle is excessive.

If you give people free parking, they will always feel entitled to free parking. It will be politically difficult to ever charge for parking. This has been the case at BART. Small, regular increases (such as those implemented by the postal service) are easier to accept than the sudden switch from free to paid parking.

BART's policy of not charging for parking raises issues of social equity. Patrons who chose to take the bus, or who can't afford a car, have to pay, but those who drive are given free parking. At a time when ridership losses are leading to talk of fare increases<sup>6</sup>, no one at BART is seriously considering charging park-and-ride users to cover the costs of operation and maintenance of the parking lots. To be fair, bus transportation is heavily subsidized already, but there are many who would argue that the private automobile is heavily subsidized as well<sup>7</sup>. Studies have been done which show that BART's ridership would

not be impacted if daily parking charges of up to \$2 were charged (Haggerty). Under this scenario, BART could generate more than \$20 million each year, with additional minimal investment.

If charging for parking doesn't affect ridership, why does BART provide financial incentives to choose environmentally unfriendly access modes? The answer lies in BART's organizational structure. BART is governed by an elected Board of Directors, of which 4 out of 9 represent exclusively suburban areas. Suburban constituents value free, plentiful parking and will presumably vote accordingly, should Board members choose to levy a parking fee.

Charging a fee for park-and-ride may not always be in the best interests of transit, either. Financially, it makes a lot of sense. The costs of constructing, operating, and maintaining park-and-ride are shifted to the user, and no longer strain already tight budgets. Many transit agencies run their parking operations at a profit, which can help to supplement farebox revenues. Drivers are sensitive to the cost of parking, however. In a situation where free parking is readily available at the driver's destination, charging a parking fee may dissuade a driver from parking and using transit. If the cost of park-and-ride combined with the fare is equal to or greater than the cost of parking in the city, many people will drive on into the city. Only extreme traffic congestion and delay, or a parking shortage at their destination,

will overcome cheaper parking.

The sensitivity to parking price works in favor of alternative modes when the cost of parking at the destination is high. In Boston, for example, high parking prices support relatively high downtown transit usage. The cost of parking has been shown to significantly impact commuting behavior. A 1999 Chicago Transit Authority customer survey found that 64% of respondents considered the cost of parking at the destination to be a major factor in their decision to ride transit, second only to the availability of nearby service. 'Not enough parking' was also cited by 52% of respondents as a major factor. (CTA 1999)

A second danger in charging for parking lies in the fact that park-and-ride lots and commercial parking garages may tempt transit authorities away from a known money-losing business, transit, to a known money-maker, parking. Where money is concerned, motives can be confused. When given the choice between using station-area land for development, which could, in the long run, build ridership and community, and using station-area land for parking, which will immediately bring in revenue and a set number of riders, many transit agencies may pick the latter.



## VII. GUIDING PRINCIPLES

### Policy Recommendations

I began this research assuming that TOD was largely the domain of the transit agency. I soon discovered that although transit agencies are limited in their ability to promote TOD, other agencies at the local, state, and federal levels have influence. With this in mind, I have assembled an outline of the kinds of policies that can reduce the conflict between parking and TOD. The needs of different stations in different communities will vary, but these principles will likely be applicable.

At the local level, municipal ordinances such as zoning codes, landscape ordinances, subdivision regulations, and others, govern land use and development. These ordinances should be examined to ensure that they encourage TOD, or, at the very least, allow it. Many existing suburban zoning codes may not allow the higher densities and smaller lots that make TOD work.

#### *Parking ratios*

Parking ratios, in particular, should be given careful attention by local planners. Zoning ordinances regulate the parking supply through parking ratios. Parking ratios typically mandate a minimum number of off-street parking stalls per square foot of development, residential unit, or other denominator for any building. Parking ratios grew out of parking shortages experienced during America's rapid period of growth in pri-

vate automobile ownership. Cities designed for pedestrians, horses, and streetcars, had inadequate parking to accommodate a burgeoning automotive population. Requiring each development to contain all of its parking on-site was a certain way to provide sufficient parking. The motivation behind minimum parking ratios, even today, is risk avoidance. 'Overspill' parking, when drivers 'spill over' from a development into another development or onto local streets, is highly unpopular with neighbors. As the purpose of mandating parking is to ensure an adequate supply, most codes err heavily on the side of excess.

Parking ratios can be a hidden obstacle to TOD. For example, if the local zoning ordinance prescribes the same number of parking spaces for a grocery store next to a transit station and one 30 miles from a transit station, the cost of construction of the former will be increased, and its location efficiencies will be highly reduced.

In all but the most sophisticated of cities, parking ratios are applied with little regard for the existing public parking supply, parking demand, or transit accessibility. City planning departments may not have the staff or funds budgeted to model and estimate parking demand for each individual development. The result of this system can be seen in a 1995 study that found that 45% of California cities surveyed primarily base their parking ratios on the parking ratios of neighboring cities (Willson 118). The second most

popular answer was ‘consult Institute of Transportation Engineers (ITE) handbooks’ (Willson 118). ITE handbooks estimate parking demand by measuring the peak number of cars parked in free, suburban parking lots. This data is sometimes obtained from as few as four surveys. One cannot assume that ITE standards can predict parking demand for urban areas with transit service. Only 4% of cities surveyed commission local parking studies to determine demand (Willson 118). The lack of site-specific analysis propagates excessively high ratios from city to city, without consideration of local conditions.

Standardized minimum parking ratios are difficult to justify, particularly in an urban setting where there are alternatives to the private automobile. While the parking demand for a particular use in a particular location might require 2.5 parking spaces for every 1000 square feet of leasable space, the same use a half-mile away may only require 1 space per 1000 square feet. In general, developers will have a sense of what sufficient parking for a particular development is and be reluctant to build more. Excess parking is wasted money for developers. Support for minimum parking ratios arises from abutters’ worries about overspill parking or lenders’ wish to secure their investment, not from a deeply held belief that 4 spaces per 1,000 square feet is an intrinsically desirable thing. Their concerns can be better addressed by implementing residential parking permit programs, increasing the shared, municipal parking supply, or creating successful

projects with less parking.

#### *Transit-supportive zoning*

Other land use regulations should be examined as well. Many towns and cities have zoning codes that do not allow higher densities, smaller lot sizes, and mixed uses that are necessary for TOD. This could be repaired by rezoning or by creating overlay districts for station areas. Station-area districts typically govern land within a quarter-mile of a transit station, but may extend further. Within these districts, transit-supportive development patterns are allowed, encouraged, or mandated. These may include higher floor-area-ratios (FAR)<sup>8</sup> ‘zero-lot-line’ zoning, which eliminates side yards and thus allows buildings to share a party wall, and maximum, rather than minimum building setbacks, to encourage a uniform streetwall. Regulations that support pedestrian-friendliness will address the street by requiring windows and doors onto the sidewalk, prohibiting parking between the sidewalk and the building, and requiring pedestrian-scale lighting. Communities that are reluctant to mandate these measures may choose to incentivize through the provision of density or other bonuses to developers. Seattle, Washington; Portland, Oregon; and Durham, North Carolina are among the cities that have chosen to revise their zoning ordinances to be more transit-supportive. Seattle’s experience has been quite positive: two TOD’s are already planned at stations on the new light rail line,

which is not yet complete.

Seattle's success is due to its comprehensive, interdisciplinary approach. While rezoning is critical to station-area planning efforts there, market analysis, community meetings, and joint development initiatives are also underway. Rezoning alone may be insufficient to spurt TOD. During the 1970s, planners in Atlanta attempted to encourage high-rise, high-density development, modeled after Toronto, around new transit stations. Unfortunately, what worked in Toronto was unsuccessful in Atlanta. Despite more proactive measures taken later, Atlanta has been largely unable to capitalize on its transit system.

#### *Parking Policies*

Other policy decisions will also affect the parking supply. At the regional or state level, parking taxes can be levied to discourage the construction of excessive parking. While many cities, including Chicago, already have some form of parking tax, these taxes are usually intended to produce revenue, not to impact the parking supply. As such, they typically quite low and are levied on the act of parking rather than the construction of a space. A parking tax would quite probably be more appropriate at the regional level than statewide. Throughout most states, the quality of transit service varies from excellent to non-existent, so that towns without transit service could be unduly impacted. Parking policy must

be implemented regionally, so as not to create a competitive disadvantage for the implementing area. If implemented in tandem with Smart Growth tools such as an Urban Growth Boundary<sup>9</sup>, the two policies together could reinforce concentrated development and reduced parking, paving the way for TOD.

At the state level, programs like Maryland's Smart Growth initiative help to shape a transit-friendly decision-making and funding environment statewide. Other programs, like California's Parking Cash-Out Law, point the way to removing hidden parking subsidies from the transportation system. The California law, passed in 1992, requires certain employers in air quality non-attainment areas to offer employees a choice between employer-provided parking and a cash benefit. The program received a boost in 1998 when the IRS code was amended to remove a tax penalty from the cash benefit.

At the Federal level, the Commuter Choice program allows employers to offer a tax-free benefit to employees who choose alternate modes of transportation for their daily commute. Enrollment in the Commuter Choice program is voluntary, unlike the California law.

Other Federal programs like Fannie Mae's Location Efficient Mortgage, the Clean Air Act, and the FTA's New Starts program all impact land use decision-making at the local level. Cities where air quality is not in compliance with EPA stan-

dards may lose federal funding unless more environmentally-friendly programs are undertaken. This may be a powerful incentive to prioritize TOD-style development. The New Starts program, which provides funding to new public transportation projects, evaluates current land use in the project area, including regional parking supply and parking policies. Localities wishing to receive New Starts funding may choose to tailor their policies accordingly. Additionally, legislative decisions on gasoline taxes, highway funding, and like can indirectly impact the parking supply.

#### *Accountability*

Transit agencies should develop internal policies regarding TOD. Without a clear policy, the agency may act in ways that run counter to its ultimate goals. When transit agencies become involved in joint development, they often directly or indirectly subsidize private development by providing land at little or no cost, securing financing for parking structure construction, or even for the project as a whole. The development in question must generate enough new ridership, or provide sufficient new amenities, so that the subsidy can be justified to the public.

The best intentions of communities and governments must be reinforced by objective, measurable standards if TOD is to become a reality. These standards could include a maximum parking ratio, a minimum transit modal share, a

minimum number of transit riders generated, or a minimum pedestrian connectivity rating. Projects such as Baltimore's Symphony Center may or may not have any significant transportation impacts. Without measuring what impacts it does have, it will be difficult to know whether or not the MTA has invested its money wisely.

#### *Community Acceptance*

On the neighborhood level, both process and design must be considered. Many communities will feel suspicious of unfamiliar development styles, and particularly of increased density, as many associate it with increased traffic and parking shortages. Design charrettes, such as the one at Pleasant Hill, are an effective way to gather community input, explain the benefits and constraints of the project, and generally create community support for the project. On the design side, there are a few fairly simple solutions to neighborhood opposition to park-and-ride. First, if parking is pushed out from the station, so that commuters have to walk through local commercial districts to access it, they are much more likely to drop off their dry-cleaning or pick up a cup of coffee. Second, local parking can be protected by establishing residential parking programs, metering public spaces and limiting the meters to increments of less than 8 hours, and by carefully enforcing existing parking regulations. Traffic congestion may be attacked via signal timing or other engineering measures, but it's unlikely to disappear. What is likely is that the

community will be more accepting of it if it brings positive benefits to the neighborhood.

### *Phasing*

To resolve conflicts between parking and TOD, it is necessary to recognize that change cannot happen all at once. One way to build a transit-friendly project while reducing risk to the developer is to use phasing. The first phase of the development may be built with near-standard amounts of parking. If the development, and transit access to it, proves successful, additional phases may require little or no additional parking. This will lower the overall parking ratio of the development. A common phasing strategy is build a project with surface parking on half or more of the parcel, and then to build a second building on the parking lot when the market is ready to support it.

### **Design Recommendations**

Station headhouses are the public face of a transit system. When they are separated from the community by a sea of parking or a monolithic parking structure, it is hard to make meaningful community connections. At stations where some amount of parking is required, the way that that parking is provided should respect the pedestrian and the surrounding area. To return to the original question, if station-area parking is required, how can it be provided with the minimum negative impact on the pedestrian environment? After

reviewing the relevant literature and analyzing existing development, I have developed a set of guidelines for station-area parking design. Fairly simple improvements to a parking structure can make it a more acceptable urban neighbor. Design strategies are outlined in the sections below.

### *Go Play In the Street*

On-street parking has much to recommend it. Not only has it been proven to slow traffic speeds, it also serves to buffer the pedestrian from traffic. It is a source of convenient, publicly accessible parking, which is more efficiently used than off-street parking. On-street parking is used by a variety of users, while off-street parking is typically limited to patrons of a particular shop or employees of a single office. There is nearly always excess capacity in off-street lots; taken together, this adds up to a significant amount of land. There are two basic forms of on-street parking: parallel and angled. Both can be used to narrow an excessively wide street, protect pedestrians, and increase the parking supply. On city streets, parallel parking is more usual than angled parking. Parallel parking can be used on fairly narrow streets, as it is less wide than angled parking. For the same reason, angled parking provides more spaces per foot of street frontage. Although angled parking was once quite common in smaller downtowns, "over the past 20 years, state highway and transportation departments have removed, or required the



Beach Street, in Daytona Beach, Florida, has recently been reconstructed to allow angled parking. Also note pedestrian improvements such as sidewalk pavers, awnings, and pedestrian-scale lighting.

removal of, angle parking on state highways as a safety measure.” (Edwards 1). Backing out of diagonal parking spaces, on or off-street, has a high accident rate (Childs). Angled parking can increase the supply of convenient, shared parking spaces, but should be handled with care. It can be safely implemented in tandem with significant traffic calming measures, preferably on a one-way, pedestrian-oriented street.

All streets in the station area, with the exception of interstates and their on and off ramps, should be striped and metered so as to allow on-street parking. While on-street parking is not ideal for commuter-oriented park-and-ride, it will reduce the need for other uses to maintain large individual parking supplies.

#### *Less is More*

Cars are more attractive singly than in groups. Car manufacturers know this, and advertise accordingly. They place a lone SUV on the mountaintop, not 1,500 SUVs in a field. The occasional motorist is no threat to a busy pedestrian thoroughfare. Similarly, small parking lots are less offensive than large ones. A small parking lot is more human in scale. “Pocket parking lots” of no more than 20 stalls are ideal. Where large numbers of cars must be accommodated in surface lots, visually breaking up the vast field of parking with clustered plantings can be helpful. Many zoning codes contain landscape provisions that demand one tree to be planted for a certain

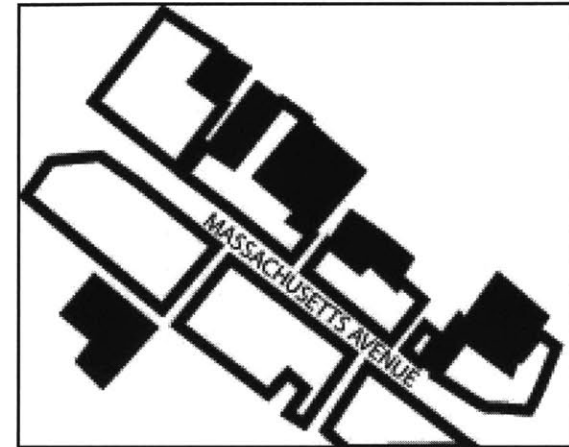
number of parking stalls. When these can be clustered together, their visual and environmental impact is greater.

In the station area, where higher levels of pedestrian activity can be anticipated, clearly marked, insulated pedestrian paths through large surface lots are essential for safety, comfort, and way-finding. These paths can serve to break up a pre-existing surface lot with a minimum of expense. Concentrating plantings along these paths can increase their attractiveness, while buffering the pedestrian from the auto.

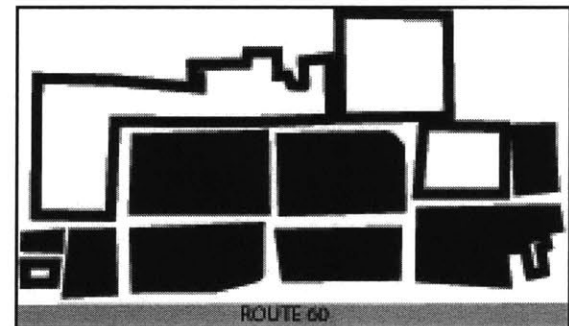
#### *Location, location, location*

The location of the parking on the site can affect its impact on the quality of the pedestrian environment. The layout of the typical ‘big box’ retail store, where a large parking lot is located between the store itself and the sidewalk (if, indeed, a sidewalk exists) makes reaching the store on foot extremely unpleasant. Pushing a building back from the sidewalk interrupts the streetwall, decreases the perception of security and activity, and increases the real walking distance for pedestrians to reach it. When at all possible, parking should be located away from the main street. Having an entrance that opens onto the sidewalk greatly increases the building’s pedestrian interest and accessibility.

The pedestrian environment is particularly sensitive to the location of station-area parking. When



Central Square, Cambridge, MA. Buildings are shown in white and parking in black. These buildings have retail uses on the ground floor and office and residential uses on the upper floors. The MBTA Red Line has a stop here and there is frequent bus service. Notice how the parking is tucked behind the buildings, which front on the main street.



Route 60, Revere, MA. This typical strip shopping plaza pushes its retail buildings as far from the street as possible, so as to maximize the visibility of the large surface parking lots.

the station is separated from a neighborhood by a moat of parking, it is isolated from the community. Locating a park-and-ride lot or structure a few blocks away from the transit station will not only better integrate the station into the neighborhood, it will also encourage commuters to patronize local stores and open up the possibility of the park-and-ride lot being used to support other functions on nights and weekends when commuters are scarce.

#### *Parking Structures are not HVAC Units*

Parking structures, above or below ground, are generally unpleasant environments for the user, the passerby, and the neighborhood. Above-ground structures have a distinct typology. They are built of long slabs of precast concrete, which alternate with long openings for ventilation. This pattern creates a strong horizontal element, usually relieved only by the elevator and staircase towers. Their design usually tends toward the bare minimum of functionality.

Parking structures in an urban setting break contextual 'rules' of design. The basic module of building construction is the bay, a vertical unit repeated horizontally along the edge of a building. We perceive the bay through its supporting columns and elements placed between these columns, such as windows and doors. This gives the building an overall vertical orientation. In a parking structure, the overwhelming perception of horizontality makes it difficult to distinguish

the bays. This sets the parking structure apart from the surrounding built environment. In addition, the mass-to-void ratio of a parking structure is heavily skewed in favor of the void. With few exceptions, buildings appear to be solid objects, pierced with windows and doors. The long, bare, horizontal openings of a parking structure are both disconcerting and alienating to the pedestrian.

Modern buildings have a complex support system, hidden in basements, on rooftops, and behind false ceilings. For example, the interior climate is regulated by the heating ventilation and air conditioning (HVAC) unit. It's an integral part of the building's function, but not one intended for display. The HVAC unit is typically relegated to the rooftop, where it can do its job without being seen.

Parking structures, too, are a part of the support system. They are often designed with the same perfunctory attitude. But frankly, they are not on the same level as the HVAC unit. The huge size of a parking structure, and their use by members of the public, makes a impact on the surrounding environment far beyond that of a rooftop HVAC unit.

Due to their massive size, it is prohibitively expensive to locate parking structures where they cannot be seen. Typical suburban office developments are required to build five parking spaces per 1,000 square feet of office space. If this park-

ing is put into a structure, 1750 square feet of parking structure will have to be built for every 1000 square feet of office space. And at construction costs that range from \$15,000 up to \$40,000 per space for underground parking, relatively few developments will be able to build underground parking and turn a profit.

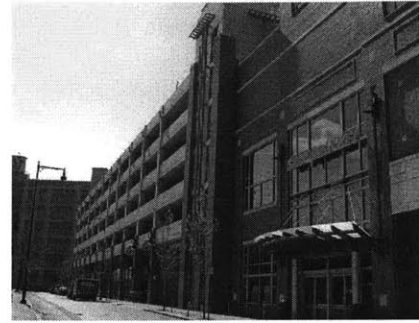
If most parking structures can't be hidden away, then, how can their impacts on the pedestrian environment be alleviated? Designers have tried a range of measures, from roof gardens to public art, in an attempt to better integrate parking structures into the urban fabric. Nearly all of these techniques are intended to bring the parking structure into harmony with an urban environment. As such, they typically strive to introduce verticality and human scale, and to reduce the impact of the long horizontal openings typical of parking structures.





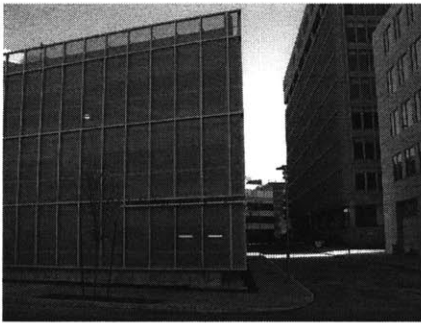
LANDSCAPING

At New Carrollton Station in Maryland (WMATA), paths leading from the station to the parking structure have been heavily landscaped, soften its edges somewhat. This is a reasonable solution at New Carrollton, which is in a fairly undeveloped area. Designers have also attempted to add interest to this essentially traditional parking structure by rippling the exterior edges and including a colorful mural on the stair tower.



VERTICAL ELEMENTS

At University Park in Cambridge, Massachusetts, numerous vertical elements have been included to reduce the structure's horizontality. Brick columns, decorative copper, and trellises add interest and help to break up the façade.



SCREENING

The Technology Square Garage, in Cambridge, Massachusetts is screened with a facade of perforated metal sheets. This allows natural light and air to filter into the garage while screening the interior from the adjacent neighborhood. Panels also add scale and visual appeal.



ROOF GARDENS

Parking structures are typically single-use structures, but they may incorporate other uses. Some have dedicated the upper floors to office use or a roof garden, which often results in a zoning bonus of some kind. While these kinds of improvements may increase the efficient use of the site, or reduce the 'urban heat island' effect, they have little to no impact on the quality of the pedestrian environment. This roof garden, at a hotel in Cambridge, Massachusetts, is nearly invisible from ground



SCREENING, GROUND FLOOR

At University Park, trellises are used to screen the garage at street level only. Climbing vines on the trellises and landscaping between them increase the attractiveness of the garage. The metal trellises increase security within the garage by reducing access to the interior while maintaining visibility.



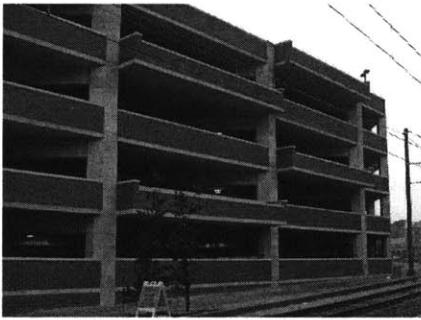
UNDERGROUND PARKING

Post Office Square in Boston underwent a dramatic transformation in the early 1990s, when a consortium of adjacent landowners sponsored the construction of an underground parking garage to replace an existing surface garage. The surface of the garage was converted into a lushly landscaped park, popular with office employees at the lunch hour. Underground parking removes, at one fell swoop, nearly all aesthetic objections to structured parking. Its cost, however, is extraordinarily high.



FACADE ARTICULATION

Articulation in design is essentially the breaking down of a larger surface into smaller, more pleasing components. This could involve adding depth, color, or new materials to the surface. This hotel parking structure in San Juan, Puerto Rico uses color and repeating decorative elements add interest and a sense of movement to the façade.



MATERIALS

The extensive use of a single material - concrete slabs - in parking structure construction exacerbates its monolithic scale. Incorporating other materials with a finer grain can help to bring a parking structure into scale with its surroundings. At Symphony Center in Baltimore, Maryland, the designers have used red brick, which is a theme throughout the project. Using the same material helps integrate the parking structure with the rest of the project and the finer grain of the bricks reduces scale.



PUBLIC ART

A parking structure, like a vacant lot, can be an opportunity in disguise. Some communities have furthered the dual goals of sponsoring public art and improving a public eyesore by turning parking structures over to artists. The Green Street Garage, in Cambridge, Massachusetts, offers up a large mural with the theme of a diverse community. The mural adds interest to the face of the garage, which also houses a public library branch. The monolithic scale of many garages can overwhelm public art efforts; care must be taken to work at an appropriate scale.



PUBLIC ART, INTERACTIVE

The Seventh Street Garage in Charlotte, North Carolina, takes public art a step further. Sound artist Christopher Janney's installation "Touch My Building", adds movement, color, and an element of public participation to a downtown parking garage. Tall 'fins' attached to the building, light up and play various sounds when touched. The entire building 'goes off' hourly, playing a short musical piece. The building will also 'go off' if the fins are pressed in the correct order, revealed in a riddle written on the building.



VENEER

At Market Common, in Clarendon, VA, developers of an upscale, innovative shopping mall abutting a residential neighborhood have attempted to protect existing residents from development impacts with a buffer zone of housing surrounding the mall. The parking garage is 'wrapped' with a veneer of multi-family residential on two of its four sides. This same technique is due to be used at Pleasant Hill (BART) and has been used successfully at Lennox Marketplace in Atlanta, GA. Lennox Marketplace 'wraps' its parking garage with 'big box' retail development on all four sides.



PUBLIC PLAZA

The Minillias Government Center, in San Juan, Puerto Rico has two major office towers and a large parking structure to support them. A pedestrian plaza on the roof of the parking structure connects the towers. The plaza also connects to the street level via a flight of stairs. While many public plazas raised above the street level are underused, the large worker population of Government Center provides a steady stream of office employees eating lunch or taking a break.

## VIII. APPLICATION

I have used the term ‘station-area’ broadly in this thesis. The ¼ mile area around a transit station may consist of anything from a bustling Central Business District to a parking lot and a field, however. The above policies must be applied with regard to existing conditions in the station-area and assumptions about their future development. Five station-area typologies, with relevant policy considerations, are suggested: healthy downtown, struggling downtown, urban neighborhood, suburban neighborhood, and terminal stations. Regional policies, such as parking tax, parking cash-out programs, and commuter choice-type programs, are suitable to all of these areas.

### Healthy Downtown

Transit stations in a healthy downtown should have no on-site parking, and limited parking in the station area. The higher densities, mix of uses, and concentration of transit service found in most downtowns means that transit patrons will be able to access the station by walking, cycling, feeder bus, or taxi. The advantages of the central business district are those of concentrated activity and begin to dissipate as parking increases and density decreases. Here, progressive parking policies like maximum parking ratios or even mandatory underground structured parking could be possible strategies. To provide for some flexibility, additional parking or surface parking could be permitted as conditional uses, putting

the burden of proof on the developer. If above-ground structured parking is allowed, it should be required to include active uses on the first floor.

### Struggling Downtown

A transit station in a struggling downtown, one that is losing population, jobs, and activity, may require some on-site parking to survive. A struggling downtown often sees itself in direct competition with its suburbs. Instead of concentrating on the unique advantages of a central business district, local officials may feel compelled to offer plentiful parking to retain and attract commercial activity. Commercial parking may be a more profitable use than maintaining a vacant building. If the downtown is ever to regain its vibrancy, however, this parking should be provided in lots, which are easier to redevelop. Office towers built on a platform of 5 or 6 stories of parking are expensive to build, unlikely to be demolished, and absolutely toxic to a downtown.

### Urban Neighborhood

In an urban neighborhood, the station itself may not require on-site parking, but surrounding shops, offices, and residences probably will require some parking. The parking needs of an urban neighborhood with transit service can often be met through a combination of on-street parking and small off-street lots. High densities can be allowed in the immediate station area, which may otherwise be at something of a

competitive disadvantage, due to increased activity and noise in the station area. Older areas may have well-established neighborhoods, where parking controls may be particularly useful to prevent ill-conceived adaptations of older patterns to high levels of auto ownership. In Boston's Brighton, small front yards in older residential neighborhoods have been paved over to provide parking for tenants, making the streets less pleasant. This process allows older homes to be subdivided into apartments, which in Boston with its large student population, has driven up housing prices.

### **Suburban Neighborhood**

The vast majority of American development is suburban in nature. As younger cities, like Charlotte, NC and Phoenix, AZ consider transit as a possible solution to their traffic congestion, questions of suburban transit stations will increase in importance. The strategy in a suburban neighborhood should be to set up an environment where TOD could occur, not necessarily to immediately implement it. Consequently, pedestrian-friendly site and design guidelines should be instituted. Other programs, such as Main Streets USA, may be useful. These measures will create a better neighborhood streetscape, regardless of whether or not TOD as such is taking place.

In a suburban neighborhood, the transit station will quite likely require some parking, as will surrounding land uses. The total number of

spaces provided should be able to be reduced vis-à-vis neighborhoods with no transit service. The presence of feeder bus lines will further reduce the need for station-area parking. Municipal parking lots, and possibly municipal garages, are especially important in a suburban neighborhood, to create shared parking opportunities and reduce the overall supply. Care must be taken with the design of municipal garages so that they reinforce pedestrian design principles and do not unduly impact the pedestrian environment.

Adjacent to the transit station itself, space should be dedicated to small kiosks, coffee shops, dry-cleaners, and other amenities that appeal both to transit users and the larger neighborhood. These complementary uses will help to make the transit station attractive and convenient, as well as promoting both real and perceived safety. In addition, locating active commercial uses next to the station may aid in the eventual transition to TOD.

### **Terminal**

Terminal stations are often, though not always, located away from developed areas. This provides ample space for rail yards and extensive park-and-ride lots to catch commuters from all points beyond the end of the line. Non-transportation uses located in the area of a terminal station may have parking ratios comparable to non-transit accessible areas, due to the poor quality of the pedestrian environment. This type of station environment may also be found at the stations

immediately before the actual terminal station.

Terminal stations are often challenging to develop. If a transit line is extended, suddenly the terminal station has twice the accessibility and becomes a more desirable development location. If the station is located in a developed area, an approach similar to the suburban neighborhood approach could be taken.

The presence of transportation facilities makes pedestrian-friendliness a tricky proposition. Bus service to a terminal station will still be higher than in other neighborhoods, which could reduce the actual parking demand somewhat. To provide for the possibility of future development while accommodating current uses, surface, not structured, parking is recommended. A small amenity, such as a coffee stand or kiosk, could do much to improve the atmosphere of the parking lot.

## IX. CONCLUSION

Transit-Oriented Development will have little to no direct impact on the lives of most Americans. It can, however, improve the quality of life in certain neighborhoods of larger cities, and perhaps indirectly aid their suburban neighbors. While TOD has positive environmental, social, and health benefits<sup>10</sup>, it can only work where a particular set of conditions exists. TOD cannot be built everywhere, nor should it. Not all Americans want to walk to the grocery store, just as not all Americans want to do yard work. Supporting TOD initiatives increases choice both in the housing market and in personal transportation.

For the successful implementation of TOD, parking conflicts must be resolved. In this thesis, I have attempted to suggest regulatory policies and design strategies that can contribute to a resolution. Changing transportation, development, and regulatory patterns in one fell swoop is extremely difficult. It is important to recognize the usefulness of careful phasing. It is equally important, however, to be cognizant of the ultimate goal when planning the intermediate stages, lest it should be permanently delayed.

### **Recommendations for Tren Urbano**

If Puerto Rico is serious about future station-area development, outstanding parking issues must be resolved. Some suggestions:

*Enforce existing parking regulations*

Double, triple, and sidewalk parking must be eliminated. The first two reduce the operational capacity of feeder bus service to Tren Urbano; the third makes walking extremely difficult. The Puerto Rican Highway and Transportation Authority (PRHTA), the Planning Board, and the Police Department must coordinate efforts to enforce parking regulations.

*Work to create 'pocket parking' for station-area commercial uses*

Once parking regulations are enforced, the real parking supply will be greatly reduced. Small-scale 'pocket parking lots' scattered throughout commercial districts will provide some relief, while not unduly impacting the pedestrian environment. Clear, visible, and attractive signage should guide visitors to these lots.

*Consider public education campaign for changes in parking policy*

Drivers who are accustomed to parking whenever and wherever they please will be unhappily surprised by enforcement of parking regulations. Some kind of public outreach program could both prepare drivers for change and inform them of new parking lots and alternatives to driving.

*Reconsider price ceilings for commercial parking*

The Puerto Rican Department of Consumer Affairs (DACO) currently regulates parking prices to protect consumers' right to transportation. The opening of Tren Urbano, and accompanying improvements to public buses and jitneys, provides real alternatives to the private automobile. If DACO chose to remove these price ceilings, commuters could have an incentive to investigate public transportation and how it could benefit them. If maximum parking ratios have not been implemented, however, this strategy could backfire by making parking a more attractive business and increasing the parking supply.

*Charge a parking fee from day one*

At Tren Urbano, charging a parking fee from opening day, no matter how nominal, will help prevent the kind of political battles that BART faces in charging for parking. If DACO reconsiders its policy of setting price ceilings for commercial parking charges, Tren Urbano may be able to charge a more substantive fee.

*Allow off-site replacement parking*

The policy of requiring one-to-one replacement parking complicates the development of surface park-and-ride lots. Replacing these spaces in a structure is expensive, which either forces the transit agency to subsidize its construction, or restricts the uses of the development to high-end luxury uses, so that the developer can subsidize their construction. This policy prioritizes existing

park-and-riders over potential station-area residents and workers, reserving valuable station-area land for an inactive use.

On the other hand, mandating one-to-one replacement parking allows the transit agency to 'hedge its bets', ensuring at least the same ridership after completion of the development. It also placates the parking constituency, who may otherwise protest.

A compromise position is recommended. Tren Urbano has proposed a series of remote park-and-ride plazas in the hinterlands of the San Juan metropolitan area, connected to Tren Urbano stations by high-frequency over-the-road shuttle service in HOV lanes. The proposed locations are largely in 'leftover' highway parcels; parking there will offend no one's sensibilities. If developers are allowed to relocate park-and-ride stalls to these remote plazas, they can develop station-area lands to their highest and best uses.

*Remove minimum parking ratios*

The Planning Board should reduce or remove minimum parking ratios in their new station-area districts. This will allow TOD to be built without excessive amounts of parking. To ensure that parking is kept to a minimum, the Planning Board should implement maximum parking ratios. In a neighborhood where a parking deficit already exists, or where it is financially infeasible to develop with limited parking, maximum ratios

could be waived.

*Set design guidelines for station-area parking*

Station-area plans should include design guidelines for parking lots and structures. The most design elements, location and façade improvements to structures, should be mandated. Other elements, such as public art, could be recommended or incentivized through density bonuses.

Even after these, largely regulatory, strategies are implemented, securing financing may still be problematic. Lenders' objections may disappear after successful demonstration projects.

**Future Work**

A real limitation of this thesis is a lack of information regarding the costs and benefits of providing different kinds of station access to patrons. While interviewees offered much in the way of anecdotal observations, these were seldom backed up by research. A future study calculating the real costs of providing for various forms of station access, under a variety of land use scenarios, would help to clarify the picture.

Resolution of parking conflicts requires further research into what 'sufficient' parking for a TOD really is. This could include the development of new methods to better research parking demand, to aid planners and developers alike. Once developed, these methods could serve to alleviate

planners', developers', and lenders' fears of parking shortages.

Finally, the development of a new governance model, to address the conflict between regional transportation needs and local land use concerns, could be a fruitful research topic.



## ENDNOTES

<sup>1</sup> The modal share represents the percentage of trips made by each mode of transportation – automobile, transit, walking, etc.

<sup>2</sup> Parking ratios are the term used to describe the ratio of parking spaces to square footage of built space, number of seats in a theater, or some other demoninator.

<sup>3</sup> A development was planned for Alewife in the mid-1980s, which would have been centered around the second headhouse. This development would have brought an additional 2,000 spaces to Alewife, which caused community opposition to the plan.

<sup>4</sup> Paratransit is “the full spectrum of transportation options that fall between the private automobile and the conventional bus.” Examples include shared-ride taxis, dial-a-ride, jitneys, commuter vans and employer sponsored services such as shuttles, van-pools and buspools (Cervero, “Paratransit” 14-15).

<sup>5</sup> While Joint Development’s contribution is impressive, the total WMATA operating and capital improvements budget is 1.942 billion dollars.

<sup>6</sup> BART’s Board of Directors voted on 1/24/02 to delay decision on a fare increase for one year.

<sup>7</sup> “Roadway users in the United States pay only around 60% of the costs of roadway construction, maintenance, administration, and law enforcement through fuel taxes and other fees” (Cervero, *Transit Villages*, 64).

<sup>8</sup> FAR is a measure of density that compares the square footage of built space to lot area.

<sup>9</sup> An Urban Growth Boundary essentially draws a line around a metropolitan area, beyond which only limited development may occur. Urban Growth Boundaries are intended to focus development to areas with existing public infrastructure. A well-

known example of this is Portland, Oregon.

<sup>10</sup> The physical design of a TOD encourages more walking and less driving, which is part of an overall healthy lifestyle.

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#### **Internet Resources**

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Arlington County, VA

[http://www.co.arlington.va.us/cphd/  
planning/metro\\_profile/index.htm](http://www.co.arlington.va.us/cphd/planning/metro_profile/index.htm)

[http://www.co.arlington.va.us/cphd/  
planning/development\\_highlights01/  
dev2001.htm](http://www.co.arlington.va.us/cphd/planning/development_highlights01/dev2001.htm)

#### BART FARE HIKE

[http://beta.kpix.com/news/local/2002/01/  
24/No BART Fare Hike.html](http://beta.kpix.com/news/local/2002/01/24/No_BART_Fare_Hike.html)

#### BALTIMORE POPULATION

[http://www.archbalt.org/beyondtheboundaries/  
PopulationMeltdown.htm](http://www.archbalt.org/beyondtheboundaries/PopulationMeltdown.htm)